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2001-2010: Decade to Roll Back Malaria in Developing Countries, Particularly in Africa

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Note by the Secretary-General

The Secretary-General hereby transmits a report prepared by the World Health Organization, pursuant to General Assembly resolution 62/180.

Summary

The present report highlights the progress made in meeting the goals concerning malaria to be achieved by 2010 in the context of General Assembly resolution 62/180. The report is based on data collected for the *World Malaria Report 2008*, which will be published in late September 2008. The report presents preliminary analysis of data reported to the World Health Organization (WHO) in late 2007 and additional data collected through surveys, primarily demographic and health surveys, multiple indicator cluster surveys and malaria indicator surveys. The report also presents conclusions and recommendations for the consideration of the Assembly.

Funding and availability of key products for prevention and treatment of malaria have started to increase in the Africa region starting in 2005 and accelerating in 2006. According to data for 2006 from national malaria control programmes, a total of $688 million was spent on malaria in the African region in 2006. This is certain to be an underestimate, because financial data were submitted by only 26 out of 45 countries.

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The targets for use of insecticide-treated nets, prompt and appropriate use of antimalarial treatments, and use of intermittent preventive therapy in pregnant women in Africa are 80 per cent or more. Average usage of treated nets across 18 countries where surveys were conducted in 2006 was well below the 80 per cent target: 34 per cent of houses owned an insecticide-treated net and 23 per cent of children under 5 years of age and 27 per cent of pregnant women slept under a treated net. Although this is much below the 2010 target, it is much higher than in previous years and represents a significant achievement. Among 18 national household surveys carried out in the Africa region in 2006, relatively high ownership and usage of insecticide-treated nets, including long-lasting insecticide-treated nets, was found in Ethiopia, Niger, Sao Tome and Principe and Zambia.

Between 2001 and 2006, national malaria control programmes in Africa reported large increases in the number of courses of antimalarial medicines supplied through public health services. In particular, dispensing of artemisinin-based combination therapy treatments increased from 6 million doses in 2005 to 45 million doses in 2006. These figures probably underestimate usage and the exact consumption of artemisinin-based treatments is not known.

In 2006, the average percentage of children under 5 years of age receiving any type of antimalarial treatment for fever in the past two weeks was 38 per cent. The use of artemisinin-based combination therapy was much lower: just 3 per cent of children, on average. Therefore, access to this therapy remains very inadequate.

Recently, *Plasmodium falciparum* malaria parasites that have a reduced susceptibility to artemisinins, possibly heralding resistance, have been detected at the border between Cambodia and Thailand, and malaria vectors in several countries have displayed some degree of resistance to pyrethroids. Therefore, the continuous monitoring of their efficacy in the field and adoption of measures to mitigate the risk of resistance are being considered priorities for malaria control.

From an Africa-wide perspective, there was no evidence that malaria had declined from 2000 to 2006. However, there are two reasons for optimism. First, data available to WHO included data only until 2006; rapid increases in use of insecticide-treated nets and artemisinin-based combination therapy in 2006 and 2007 would not be expected to show their full impact by 2006. Secondly, four low-income countries or parts of countries showed dramatic declines in malaria once high coverage of insecticide-treated nets and antimalarial medicines (and indoor residual spraying of insecticide in some cases) were achieved. In Eritrea, Rwanda, Sao Tome and Principe and Zanzibar, United Republic of Tanzania, the burden caused by malaria appeared to be reduced by 50 per cent or more between 2000 and 2006-2007, thus achieving the morbidity reduction targets. Three other higher-income African countries (Namibia, South Africa and Swaziland) also had significant declines in reported malaria cases.

Within Africa, the large increase in availability of products to prevent and treat malaria in 2006 and 2007 has a reasonable probability of yielding an impact in 2007 and 2008. WHO plans to report back on that data in mid-2009.

In regions outside of Africa, malaria cases fell by 50 per cent over the period 2000-2006 in at least 22 out of 64 countries. Thus, routine surveillance data indicate that at least 29 out of 109 countries around the world are on course to meet targets for reducing the burden caused by malaria by 2010.

I. Background and context

1. A renewed effort to control malaria worldwide, moving towards elimination in some countries, is founded on the latest generation of effective tools and methods for prevention and cure. The advent of long-lasting insecticide-treated nets and artemisinin-based combination therapy, together with a revival of support for indoor residual spraying of insecticide, presents a new opportunity for large-scale malaria control.

2. To accelerate progress in malaria control, the 2005 World Health Assembly set targets of coverage of 80 per cent or more for four key interventions: insecticide-treated nets for people at risk; appropriate antimalarial drugs for patients with probable or confirmed malaria; indoor residual spraying of insecticide for households at risk; and intermittent preventive treatment in pregnancy. The Assembly further specified that, as a result of those interventions, malaria cases and deaths per capita should be reduced by 50 per cent or more between 2000 and 2010 and by 75 per cent or more between 2005 and 2015.

3. The *World Malaria Report 2008* uses data from routine surveillance (in approximately 100 endemic countries) and household surveys (in approximately 25 countries, mainly in Africa) to measure achievements up to 2006 and, for some aspects of malaria control, to 2007 and 2008. In five main chapters, 30 country profiles and seven annexes, the report describes: (a) the estimated burden of the disease in each of the 109 countries and territories where malaria was present in 2006; (b) how policies and strategies recommended by the World Health Organization (WHO) on malaria control have been adopted, by country, by region and globally; (c) the progress made in implementing control measures; (d) the sources of funding for malaria control; and (e) recent evidence that interventions can reduce cases and deaths.

II. Burden of malaria in 2006, by country, by region and globally

4. Half of the world's population is at risk of malaria and an estimated 250 million cases led to nearly 1 million deaths in 2006. An estimated 3.3 billion people were at risk of contracting malaria in 2006. Of this total, 2.1 billion were at low risk (less than 1 estimated case per 1,000 of the population), 97 per cent of whom were living in regions other than Africa. The 1.2 billion at high risk (1 or more cases per 1,000 of the population) were living mostly in the Africa (49 per cent) and South-East Asia (37 per cent) regions as classified by WHO.

5. There were an estimated 247 million episodes of malaria in 2006, with a wide uncertainty interval (5th to 95th centiles) of between 189 million and 327 million cases. Of these, 86 per cent, or 212 million (152 to 287 million) cases, were in the Africa region. Of the cases in Africa, 80 per cent were in 13 countries and over half were in the Democratic Republic of the Congo, Ethiopia, Kenya, Nigeria and the United Republic of Tanzania. Among the cases that occurred outside the Africa region as classified by WHO, 80 per cent were in India, the Sudan, Myanmar, Bangladesh, Indonesia, Papua New Guinea and Pakistan.

6. There were an estimated 881,000 (in the range of 610,000 to 1,212,000) malaria deaths in 2006, of which 91 per cent (801,000, in the range of 520,000 to 1,126,000) were in Africa and 85 per cent were of children under 5 years of age.

7. Estimates of malaria incidence are based, in part, on the number of cases and deaths reported by national malaria control programmes. These case and death reports are far from complete for most countries. A total of 94 million malaria cases was reported by national control programmes in 2006, or 38 per cent of the estimated global case incidence. The true proportion of malaria episodes detected by national control programmes would have been lower than 38 per cent because, in some countries, reported cases include patients that are diagnosed clinically but do not have malaria. National control programmes reported 301,000 malaria deaths, or 34 per cent of estimated deaths worldwide in 2006.

III. Policies and strategies for malaria control

8. National malaria control programmes have adopted many of the policies on prevention and cure recommended by WHO, but with variation among countries and regions. Nearly all of the 45 countries in the Africa region had adopted, by the end of 2006, the policy of providing insecticide-treated nets free of charge to children and pregnant women, but only 16 aimed to cover all age groups at risk. Insecticide-treated nets are also used in a high proportion of countries in the South-East Asia and Western Pacific regions, but in relatively few countries in the other three regions as classified by WHO.

9. Indoor residual spraying is generally used in areas of high malaria transmission. Such spraying is the dominant method of vector control in the European region. It is used in fewer countries in Africa, the Americas and South-East Asia and is used the least in the Western Pacific region.

10. By June 2008, all except four countries and territories worldwide had adopted artemisinin-based combination therapy as the first-line treatment for falciparum malaria. Free treatment with that therapy was available in 8 out of 10 countries in the South-East Asia region, but in a smaller proportion of countries in other regions.

11. The systematic use of intermittent preventive treatment in pregnancy is restricted to the Africa region; 33 of the 45 African countries had adopted the treatment as national policy by the end of 2006.

12. The current highly effective interventions are based on two essential chemical entities: artemisinins and chemical insecticides, which are constantly threatened by the development of parasite and mosquito resistance. Recently *Plasmodium falciparum* malaria parasites with a reduced susceptibility to artemisinins, possibly heralding resistance, have been detected at the border between Cambodia and Thailand and malaria vectors in several countries display some degree of resistance to pyrethroids. Therefore, the continuous monitoring of their efficacy in the field and adoption of measures to mitigate the risk of resistance are being considered priorities in malaria control.

IV. Preventing malaria

13. Despite big increases in the supply of mosquito nets, especially of long-lasting insecticide-treated nets in Africa, the number of nets available is still far below the need in most countries. Between 2004 and 2006, there were modest increases in the supply of conventional insecticide-treated nets to countries in the Africa, South-East Asia and Western Pacific regions, the three regions where nets are most frequently used. By contrast, there was a large increase in the supply of long-lasting insecticide-treated nets to countries in the Africa region, reaching 36 million in 2006.

14. Based on records from national malaria control programmes of supplies of insecticide-treated nets, however, only six countries in the Africa region had sufficient nets (insecticide-treated nets, including long-lasting insecticide-treated nets) by 2006 to cover at least 50 per cent of people at risk. These were Ethiopia, Kenya, Madagascar, Niger, Sao Tome and Principe and Zambia.

15. Among 18 national household surveys carried out in the Africa region in 2006, a relatively high ownership and usage of insecticide-treated nets, including long-lasting insecticide-treated nets, was found in Ethiopia, Niger, Sao Tome and Principe and Zambia. The proportion of family members (children and pregnant women) that slept under an insecticide-treated net was typically smaller than the proportion of households that owned a treated net. There was a wide variation in ownership and use of treated nets among countries: household ownership of at least one net varied from 6 per cent in Côte d'Ivoire to 65 per cent in Niger. Average treated-net coverage across the 18 countries with surveys was far below the 80 per cent target: 34 per cent of households owned an insecticide-treated net, and 23 per cent of children under 5 years of age and 27 per cent of pregnant women slept under one.

16. In regions other than Africa, insecticide-treated nets are usually targeted at high-risk populations. While the size of those targeted populations is not known, data from national malaria control programmes indicate that relatively high coverage (greater than 20 per cent of all people at risk) was achieved in Bhutan, Papua New Guinea, the Solomon Islands and Vanuatu.

17. Targeted indoor residual spraying is used in all regions of the world. In the Africa region, data from national malaria control programmes indicate that more than 70 per cent of households at any risk of malaria were covered in Botswana, Namibia, Sao Tome and Principe, South Africa and Swaziland. In other regions of the world, relatively high coverage (greater than 20 per cent of people at risk) was achieved only in Bhutan and Suriname.

V. Treating malaria

18. The procurement of antimalarial medicines through public health services increased sharply between 2001 and 2006, but access to treatment, especially with artemisinin-based combination therapy, was inadequate in all countries surveyed in 2006. Between 2001 and 2006, national malaria control programmes reported large increases in the number of courses of antimalarial drugs supplied through public health services. In particular, delivery of artemisinin-based combination therapy increased from 6 million doses in 2005 to 49 million doses in 2006, of which

45 million doses were for African countries. These figures probably underestimate usage and the exact consumption of such therapy is not known.

19. According to data from national malaria control programmes, only 16 million rapid diagnostic tests were delivered in 2006, of which 11 million were for countries in Africa, a small quantity in comparison with the number of malaria episodes.

20. Considering drugs supplied in the public sector (through national malaria control programmes) in relation to estimated malaria cases as a measure of potential demand, the African countries best-provisioned with any antimalarial drugs in 2006 were Botswana, the Comoros, Eritrea, Malawi, Sao Tome and Principe, Senegal, the United Republic of Tanzania and Zimbabwe. Among this group of countries, Eritrea, Sao Tome and Principe and the United Republic of Tanzania were also relatively well supplied with artemisinin-based combination therapy treatments.

21. According to national household surveys however, none of the populations of 18 African countries surveyed in 2006 and 2007 had adequate access to antimalarial drugs. Only in Benin, Cameroon, the Central African Republic, the Gambia, Ghana, Uganda and Zambia were more than 50 per cent of all children with fever treated with an antimalarial drug. In no country did access to treatment reach the 80 per cent target and the average across the 18 countries was 38 per cent. The use of artemisinin-based combination therapy was much lower: just 3 per cent of children on average, ranging from 0.1 per cent in Gambia to 13 per cent in Zambia.

22. A subset of 16 national household surveys found that intermittent preventive treatment (2 or more doses of sulfadoxine-pyrimethamine) was used most frequently by pregnant women in the Gambia, Malawi, Senegal and Zambia (33 to 61 per cent), and by an average of 18 per cent of women in all 16 countries.

23. In regions other than Africa, access to treatment is more difficult to judge: household surveys that include questions on treatment for malaria are much less common and, as in Africa, national control programmes do not report on diagnosis and treatment in the private sector. Nevertheless, as far as can be judged from data from national malaria control programmes, the countries relatively well provisioned with antimalarial drugs were Bhutan, the Lao People's Democratic Republic, Vanuatu and Viet Nam.

VI. Financing malaria control

24. Funding for malaria control in 2006 was reported to be higher than ever before, but it is not yet possible to judge from the budgets of national malaria control programmes which States have adequate resources for malaria control. According to data from national malaria control programmes for 2006, the Africa region had more funds for malaria control than any other and reported a larger increase in funding than any other region between 2004 and 2006. However, the total of $688 million for the Africa region in 2006 is certain to be an underestimate, because reports were submitted by only 26 of 45 countries. The $4.6 available per (estimated) malaria case in the 26 reporting countries is unlikely to be adequate to meet targets for prevention and cure.

25. The major sources of additional funds for African States between 2004 and 2006 were reported to be the national Governments of the affected countries and the

Global Fund to Fight AIDS, Tuberculosis and Malaria. These two sources dominated funding for malaria control in the Africa region and worldwide in 2006.

26. The balance of funding support varied among the regions as classified by WHO. In the Americas, the European and the South-East Asia regions, the majority of funds were from the Governments of countries where malaria is endemic. In the Eastern Mediterranean and Western Pacific regions, the Global Fund was reported to be the principal source of financial support. The Western Pacific region placed greatest reliance on external funding, followed by the Africa and Eastern Mediterranean regions. Countries in the Africa region presented the most diverse portfolio of support from external agencies.

VII. Impact of malaria control

27. Some States that have implemented aggressive programmes of prevention and cure, in Africa and in other regions, have reported significant reductions in the burden created by malaria. While the effect of malaria control can be evaluated by repeated population surveys (concerning parasite prevalence, malaria-specific mortality or all-cause mortality) the present report focuses on the inferences that can be drawn from national surveillance reports.

28. Among 41 African States that provided case and death reports over the period 1997-2006, the most persuasive evidence for impact comes from four countries, or parts of countries, with relatively small populations, good surveillance and high intervention coverage. These are Eritrea, Rwanda, Sao Tome and Principe and Zanzibar (United Republic of Tanzania). All four countries or areas reduced the burden caused by malaria by 50 per cent or more between 2000 and 2006/2007, in line with targets set by the World Health Assembly.

29. In other African countries where a high proportion of people have access to antimalarial drugs or insecticide-treated nets, such as Ethiopia, the Gambia, Kenya, Mali, Niger and Togo, routine surveillance data do not yet show, unequivocally, the expected reductions in morbidity and mortality. Either the data are incomplete or the effects of the interventions are small.

30. The reportedly high coverage of indoor residual spraying in Namibia, South Africa and Swaziland is consistent with the observed declines in case numbers in these countries and evidently builds on earlier successes achieved with indoor spraying.

31. Surveillance reports for many countries outside of Africa indicate that malaria declined during the decade 1997-2006. Malaria cases were falling in at least 25 of the 64 endemic countries in five regions as classified by WHO. In 22 of these countries, the number of reported cases fell by 50 per cent or more between 2000 and 2006/2007, in line with targets set by the World Health Assembly.

32. The recorded number of malaria deaths has fallen in at least six countries in the Americas, the South-East Asia and the Western Pacific regions. These countries are Cambodia, the Lao People's Democratic Republic, the Philippines, Suriname, Thailand and Viet Nam and all six are on course to meet targets set by the World Health Assembly for reductions in malaria mortality by 2010.

33. Reductions in cases and deaths can be linked to specific interventions in some countries, for example the targeted use of insecticide-treated nets in Cambodia, India, the Lao People's Democratic Republic and Viet Nam. In general, however, the links between interventions and trends remain ambiguous and more careful investigation of the effects of control are needed in most countries.

34. WHO has identified four phases on the path to malaria elimination. As at July 2008, the 109 countries and territories affected by malaria were classified as follows: control (80), pre-elimination (12), elimination (11) and the prevention of reintroduction (6). In January 2007, the United Arab Emirates was the first formerly endemic country since the 1980s to be certified malaria-free by WHO, bringing the total number of malaria-free countries to 93.

VIII. Conclusions and recommendations

35. **In the Africa region, funding, products and activities for malaria control dramatically increased in 2005 and 2006.**

36. **Approximately one quarter to one third of people at risk of contracting malaria have access to insecticide-treated nets in their homes as at 2006. This is much lower than the coverage target of more than 80 per cent. Use of treated nets by children and pregnant women is lagging possession of treated nets in households: that is, some households have insecticide-treated nets but they are not being used by children and pregnant women (those most at risk).**

37. **Only an average of 3 per cent of children with fever received treatment with artemisinin-based combination therapy. Insufficient doses of such therapy were delivered to States, but stock-outs at the health-facility level and insufficient access to delivery points probably also contributed.**

38. **Coverage of pregnant women with two doses of intermittent preventive treatment is also very low (18 per cent) compared to the target of above 80 per cent.**

39. **Use of indoor residual spraying has increased. The optimal mixture of indoor spraying and use of long-lasting insecticide-treated nets is a topic of ongoing investigation.**

40. **On a continent-wide basis in the Africa region, there was no evidence that malaria cases and deaths were declining as at 2006. However, those countries and parts of countries with high levels of intervention coverage showed dramatic declines in cases and deaths, including Eritrea, Rwanda, Sao Tome and Principe and Zanzibar (United Republic of Tanzania).**

41. **While the link between interventions and their effects is not always clear, at least 7 African countries and areas with relatively small populations, good surveillance and high intervention coverage reduced malaria cases and deaths by 50 per cent or more between 2000 and 2006/2007. In at least 22 countries in other regions of the world, malaria cases fell by 50 per cent over the period 2000-2006. Thus routine surveillance data indicate that at least 29 countries around the world are on course to meet targets for reducing the burden of malaria by 2010. However, deeper investigations are needed to verify reductions.**

42. Many countries in the Africa region were not able to provide data to WHO on inpatient malaria cases and deaths, nor on trends in laboratory-based indicators (the number of laboratory-confirmed malaria cases and slide positivity rate). Few countries had data on impact from other sources, such as surveys or vital event registration.

43. Member States may wish to consider the following recommendations:

(a) More funding is needed for the financing of long-lasting insecticide-treated nets, artemisinin-based combination therapy, and indoor residual spraying activities if the 2010 malaria targets and 2015 malaria and Millennium Development Goal targets are to be reached on time;

(b) Countries and partners need to ensure that drug- and insecticide-resistance testing is fully operational in order to protect current insecticides and artemisinin-based combination therapy;

(c) Countries and partners need to strengthen health information systems so that impact and logistics data are monitored continuously at national, district and health-facility levels;

(d) Malaria partners need to resolve current financial and delivery bottlenecks that are responsible for stock-outs of long-lasting insecticide-treated nets, artemisinin-based combination therapy treatments, and rapid diagnostic tests at the national level;

(e) Malaria programme management at the country level needs to be strengthened to address stock-outs of long-lasting insecticide-treated nets, artemisinin-based combination therapy treatments, and rapid diagnostic tests at health facilities and low use of insecticide-treated nets.